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ABSTRACT

This study examines the conversational behaviors of subjects with differing verbal abilities within a three-person group setting. According to a score on the Verbal Reticence Scale (Lustig, 1974), 108 subjects were rated as highly verbal, moderately verbal, or verbally reticent. From these classifications, smaller groups were selected at random to serve as "experimental subjects" from whom the data were collected, while the remaining students were group members. Throat microphones recorded each person's vocalizations separately, and the interaction of the group was collected in three other channels of the recorder. Hypotheses based on sex differences, individual differences, and group composition were analyzed according to a number of dependent variables. The data provide information about the frequency, duration, and sequencing of sound-silence behaviors in triads. The study advocates further investigation of verbal behavior patterns in small group settings so that a comprehensive theory of communicative interaction may be developed. (HAI)

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The Relationship Between Communicative Predispositions and Sound-Silence Patterns in Triads

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The Relationship Between Communicative Predispositions

and Sound-Silence Patterns in Triads

Introduction

One of the most ubiquitous findings in the small group literature concerns the stability of individual differences in temporal styles of verbal behavior. Across diverse social settings and tasks, group members have been found to exhibit relatively stable levels of verbal participation, a stability that is manifest in the frequency, duration, and pacing of their speech. Evidence of patternization in the non-content or paralinguistic features of interaction was noted by Eliot Chapple, a pioneer in research on verbal behavior. In this regard he writes:

> We all know, as a matter of observation, that people have different rates of interaction. Some of our friends or acquaintances seem to talk and act very speedily as compared to ourselves; others are slow and deliberate. These characteristics of individuals are something we intuitively recognize, and we often are at variance with the rates at which others act. For example, where there are two persons in interaction, one whose actions are quick and speech voluble, and the other, slow and given to long, well-rounded periods, we are apt to find that the speedy one keeps interrupting the slow one, jumping in when the other pauses, and so on (Chapple and Arensberg, 1940, 31-32).

The frequency of a person's verbal participation, Chapple subsequently observed, was highly consistent, regardless of the setting or individuals with whom the person was interacting (Chapple, 1942). Goldman-Eisler also found evidence of patternization, but reported even greater stability with silence patterns. She concluded from her study:

> A capacity for maintaining long periods of silence, or holding up action, or viewed differently, an inhibition or expression

> in social interaction, seems to constitute a relatively permanent feature in an individual's conversational behavior (Goldman-Eisler, 1951, 361).

Borgatta and Bales also noted this stability in a person's rate or amount of interaction, but observed that a person's rate of interaction is both a consistent manifestation of his personality (his general interaction style), and a function of the others present. They therefore suggested that for each individual there is an upper bound for him which appears to operate no matter how much opportunity he has to participate (Borgatta and Bales, 1953).

As these early researchers all suggest, people exhibit characteristic differences in their communicative rates which are relatively consistent across situations. Apparently, these differences in interaction behaviors then become a sufficient cue for subjects to attribute a variety of interpersonal judgments about themselves and others in interaction situations (Bem, 1965; Kelley, 1971; Nisbett and Valins, 1971; Hayes and Meltzer, 1972).

Much of the research in the 1950's and 1960's used this observed stability in interaction patterns to explore various measures of group behavior. Talkative persons were found to be more productive (Norfleet, 1948, more task-oriented (Strodtbeck and Mann, 1956; Knutson, 1960), more leader-like (Bass, 1949, 1951; French, 1950; Borgatta and Bales, 1956; Jaffee and Lucas, 1969), more influential (Strodtbeck, 1951; Riechen, 1958; Bales, 1953), more socially adept (Muir, 1964; Steward, 1968; Knutson, 1960; Phillips, 1965, 1968), and better liked (Strodtbeck and Hook, 1961; Bavelas et al., 1965; Bales, 1956) than their less-verbal counterparts.

More recently, a number of researchers have begun to focus on the pacing or patterning of the interaction itself, emphasizing such things as the structure of interaction sequences (Feldstein, 1972; Martin, 1972; Mayhew,

Gray, and Mayhew, 1971; Krippendorff, 1971; Jaffe, Cassotta, and Feldstein, 1964; Jaffe, Stern, and Peery, 1973; Duncan, 1972), the rate of verbal output (Matarazzo, Hess, and Saslow, 1962; Aronson and Weintraub, 1972; Condon and Ogston, 1966; Pope, Siegman, and Blass, 1970; Jaffe and Feldstein, 1970), the number of interruptions (Meltzer, Morris, and Hayes, 1971; Wiens, Saslow, and Matarazzo, 1966), and the frequency and functions of pauses and hesitations (Rochester, 1973; Mahl, 1959; Kasl and Mahl, 1965; Pope and Siegman, 1966; Pope, Siegman, and Blass, 1970; Willard and Strodtbeck, 1972).

As in the earlier studies, researchers are noting the "stable individual differences" in the patterning of verbal behavior (Jaffe and Feldstein, 1970). Unfortunately, however, few researchers have directly emphasized the relationship between individual differences in these paralinguistic aspects of verbal behavior, and fewer still have made them the central focus of investigation. Lamenting this state-of-the-art, Hayes and Meltzer conclude:

> To our mind, the forgoing results and theoretical positions could easily explain and justify an intensive interest on the part of social psychologists in the quantitative aspects (including frequency, amount, timing and patterning) of that most social of social behaviors--talk. But the strange fact is that most social psychologists have been curiously uninterested in these non-verbal but vocal features of interaction. In many of the studies we have cited above, talk was an incidental rather than major focus. Vocal productivity per se is rarely mentioned by social psychological theorists, and is infrequently referenced directly in either the major abstracts or basic textbook indexes. Despite its pervasiveness as an event and its relation to so many psychological concepts, it has not been central to research on interactional behavior (Hayes and Meltzer, 1972, 539).

Markel (1969) concurs, pointing out that authors of reviews of the literature in the area of speech and personality "are unanimous in indicating that there are vast gaps in our knowledge of the relationship between messages on the speech channel and the personality characteristics of the encoders and decoders of these messages" (Markel, 1969, 11).

It is the purpose of the present investigation, therefore, to examine these quantitative or paralinguistic aspects of verbal behavior in an effort to fill in some of the "gaps" to which Markel refers. Our interest is in the relationship between subjects who have differing propensities to engage in or withdraw from verbal interaction and their actual conversational behaviors within the small group setting. The first portion of the paper provides a descriptive classification of the temporal aspects of paralinguistic behaviors in conversations. The classification scheme is then utilized, in conjunction with the Verbal Reticence (V-R) Scale developed to assess verbal predispositions (Lustig, 1974), to develop computer-assisted techniques for the investigation of a number of hypotheses related to individual differences in the temporal patterning of paralinguistic behaviors for subjects participating in a triadic discussion situation.

A Descriptive Classification of Verbal Behavior

Following the pioneering work by Jaffe and Feldstein (1970) on conversational parameters in dialogue, the present classification will modify and extend their definitions in order to permit the analysis of conversations for groups larger than two.

(1). A conversation is defined as a sequence of sounds and silences generated by two or more interacting speakers. These sounds and silences may be generated unilaterally by a single speaker or multilaterally by joint speaking or joint silence on the part of two or more interactions.

(2). Possession of the floor is obtained by the person who utters the first unilateral sound. Once possession is obtained, it is maintained until another person utters a unilateral sound, at which time the former loses and the latter gains possession of the floor.

(3). A speaker is the person who has possession of the floor.

(4). A listener is any person who does not have possession of the floor.

(5). A speaker switch occurs whenever a speaker loses possession of the floor.

(6). Floor time is the period between speaker switches.

(7). A vocalization is a sound by the speaker.

(8). A pause is the absence of vocalization by the speaker.

(9). Simultaneous speech is a sound made by a listener during a vocalization by a speaker. Since it is within the floor time of the person who has possession of the floor (i.e., the speaker), it is assigned to that person.

Note that both simultaneous speech and pauses are assigned to the person who originally had possession of the floor. This might differ somewhat from common-sense meaning. For example, one might expect simultaneous speech to be credited to the person who talked-over the speaker and therefore created the simultaneous speech act. This is not so in the present classification scheme. The present measure refers to the "target" of the multiple speech act, and might profitably be thought of as being spoken to. Similarly, some researchers would prefer that pauses be credited to the person who ultimately obtained possession of the floor. This would permit, for example, an analysis of response latency (Willard and Strodtbeck, 1972). Again, such a coding rule has not been adopted in the present investigation. All pauses are credited to the speaker who had possession of the floor while the silence occurred.

As our definitions imply, one and only one person holds the floor at each instant of the conversation. The definitions therefore require that we be able to ascertain, at each instant, both the behavior which occurred and the speaker to whom possession of the floor should be assigned, i.e., the

direction of the last speaker switch. As Figure 1 illustrates, the various sounds and silences are all ways in which the floor time for a given individual can be partitioned. In addition to this partitioning of the floor time, the interactants who do not have possession of the floor at a given instant will either be silent or will be talking-over the speaker.

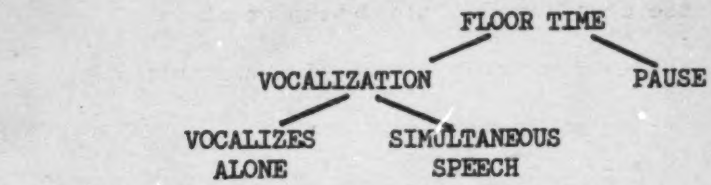


Figure 1. Tree diagram partitioning an individual's floor time into its component parts.

Given that each person in the conversation can either be speaking or silent at a given instant, the sound-silence behaviors for each moment can be described as a binary number 2^N digits in length, where N equals the number of participants in the conversation. In the present study, the interest in three-person discussions generated the eight-state classification scheme displayed in Figure 2.

However, our interest in individual differences required that we be able to classify, at each instant, not only the behaviors which occurred but also the person to whom possession of the floor should be assigned. It was therefore necessary to translate the eight-state classification into the following fifteen-state classification scheme:

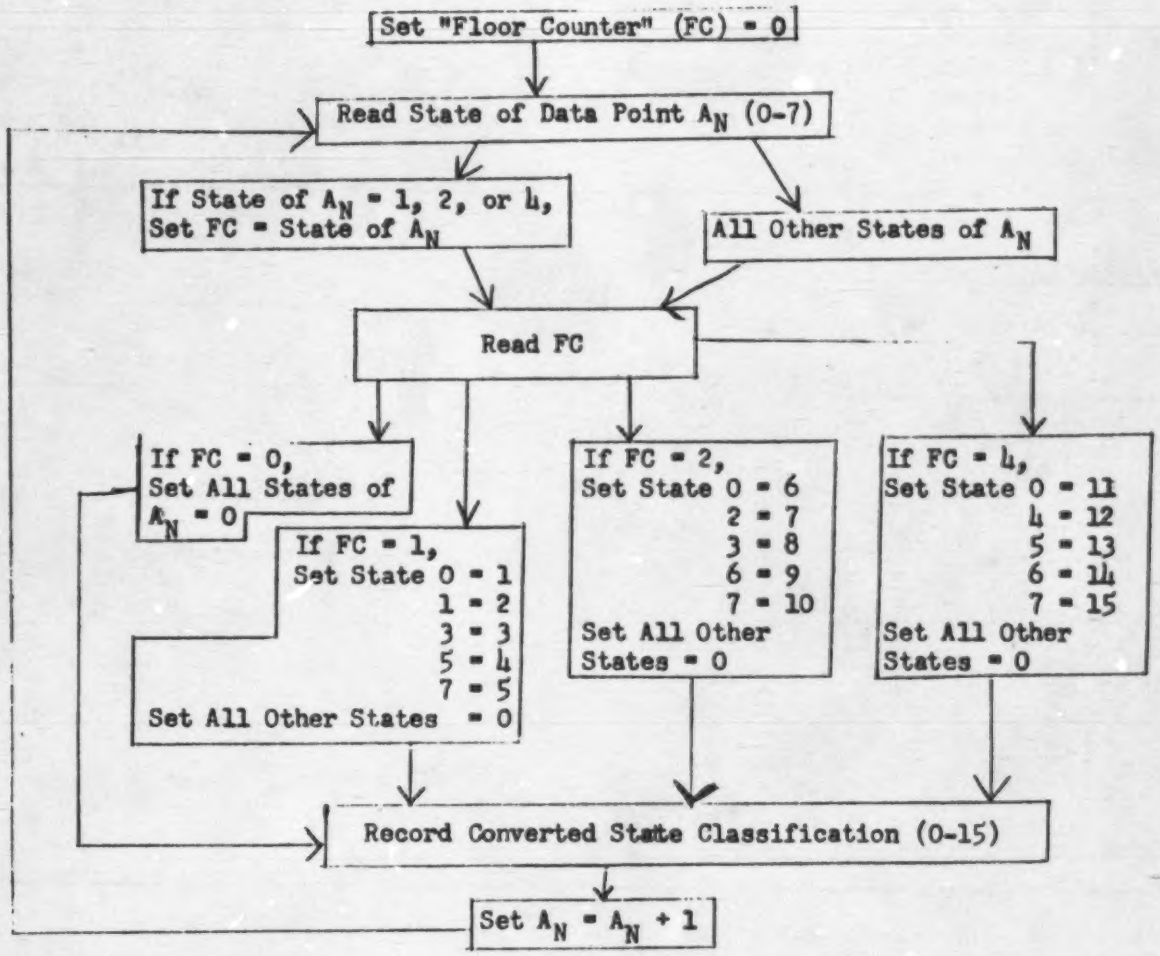
0 = unclassifiable event
1 = speaker A holds the floor; all silent
2 = speaker A holds the floor; vocalizes alone
3 = speaker A holds the floor; simultaneous speech with B
4 = speaker A holds the floor; simultaneous speech with C
5 = speaker A holds the floor; everyone talking
6 = speaker B holds the floor; all silent
7 = speaker B holds the floor; vocalizes alone
8 = speaker B holds the floor; simultaneous speech with C

9 = speaker B holds the floor; simultaneous speech with A
10 = speaker B holds the floor; everyone talking
11 = speaker C holds the floor; all silent
12 = speaker C holds the floor; vocalizes alone
13 = speaker C holds the floor; simultaneous speech with A
14 = speaker C holds the floor; simultaneous speech with B
15 = speaker C holds the floor; everyone talking

Binary Classification			Decimal Classification	Interpretation
Person C	Person B	Person A		
0	0	0	0	All Silent
0	0	1	1	Vocalization by A
0	1	0	2	Vocalization by B
0	1	1	3	Vocalization by A & B
1	0	0	4	Vocalization by C
1	0	1	5	Vocalization by A & C
1	1	0	6	Vocalization by B & C
1	1	1	7	Vocalization by A, B, & C

Figure 2. Eight-state classification scheme for sound-silence behaviors.

Figure 3 provides a flow-chart and example for converting the eight-state classification scheme into the fifteen-state classification scheme. Note that theoretically it would be possible, for example, for all participants to be talking simultaneously while speaker A holds possession of the floor (#5), followed by B and C talking simultaneously as A drops out of the conversation. Such an event is unclassifiable in the present system (#0), since possession of the floor cannot be determined. Conceptually, such events may be thought of as situations in which the interactants have failed to successfully negotiate a speaker switch. These events may eventually be of


Set "Floor Counter" (FC) = 0
Read State of Data Point A_N (0-7)
If State of A_N = 1, 2, or 4, Set FC = State of A_N
All Other States of A_N
Read FC
If FC = 0, Set All States of A_N = 0
If FC = 1, Set State 0 = 1 1 = 2 3 = 3 5 = 4 7 = 5 Set All Other States = 0
If FC = 2, Set State 0 = 6 2 = 7 3 = 8 6 = 9 7 = 10 Set All Other States = 0
If FC = 4, Set State 0 = 11 4 = 12 5 = 13 6 = 14 7 = 15 Set All Other States = 0
Record Converted State Classification (0-15)
Set $A_N = A_N + 1$

Example

8-state data:	3	0	0	1	0	1	1	3	2	0	2	3	0	4	7
15-state date:	0	0	0	2	1	2	2	3	7	6	7	8	6	12	15

Figure 3: Flow chart and example for the conversion of the eight-state classification scheme to the fifteen-state classification scheme

empirical interest as possible measures of dominance, intensity, or simply as an instance of an error in the normally-smooth sequencing of the conversationalists' vocalizations. However, for purposes of the present investigation, it was assumed that these unclassifiable events would not occur with sufficient frequency to warrant concern.

Following this classification, the fifteen categories can be recast into a transition matrix. This has been done in Figure 4. The transition matrix indicates the frequency with which each state in the system followed a given system state. The cell entries in the matrix are the number of occurrences of moving from state i at time t to state j at time t+1. The numbered cells are the only logically allowable transitions, since the only way a speaker can lose the floor is via speaker switch.

Note that the matrix is an expansion of the traditional who-follows-whom transitional sequences. This can be seen by collapsing the matrix into a more elementary form (see Figure 5). As before, the entries in the matrix refer to the movement from floor time for person i at time t to floor time for person j at time t+1. For example, cell ab refers to the transition from an act in which person A has the floor to an act in which person B has the floor. Similarly, cell bb refers to acts in which person B held the floor for two successive moments.

We are now in a position to operationalize, in terms of the cells in the large transition matrix, the conversational parameters described earlier. Since each of the rows in the matrix constitute a row vector, entire rows will be referred to by including the row label in brackets. Thus row one is [R1], row two is [R2], and so on through row fifteen, which is [R15].

A vocalization (V) for a speaker includes all entries in which a person both has the floor and is speaking:

Succeeding Event (time $\underline{t}$ + 1)

Preceeding Event (time $\underline{t}$)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	2	3	4	5		26					31			
2	6	7	8	9	10		27					32			
3	11	12	13	14	15		28					33			
4	16	17	18	19	20		29					34			
5	21	22	23	24	25		30					35			
6		36				41	42	43	44	45		66			
7		37				46	47	48	49	50		67			
8		38				51	52	53	54	55		68			
9		39				56	57	58	59	60		69			
10		40				61	62	63	64	65		70			
11		71					76				81	82	83	84	85
12		72					77				86	87	88	89	90
13		73					78				91	92	93	94	95
14		74					79				96	97	98	99	100
15		75					80				101	102	103	104	105

Figure 4: Transition matrix of the 15-state classification scheme

For speaker A, Va = [R2] + [R3] + [R4] + [R5].

For speaker B, Vb = [R7] + [R8] + [R9] + [R10].

For speaker C, Vc = [R12] + [R13] + [R14] + [R15].

Floor time (FT) for a given speaker is defined as follows:

For speaker A, FTa = [R1] + [R2] + [R3] + [R4] + [R5].

For speaker B, FTb = [R6] + [R7] + [R8] + [R9] + [R10].

For speaker C, FTc = [R11] + [R12] + [R13] + [R14] + [R15].

Simultaneous speech (Sim S) is defined as follows:

For speaker A, SimSa = [R3] + [R4] + [R5].

For speaker B, SimSb = [R8] + [R9] + [R10].

For speaker C, SimSc = [R13] + [R14] + [R15].

A speaker switch (SpS) for a given speaker includes all entries in which a person has the floor at time t but does not have the floor at time t+1. In terms of the numbered cell entries (E) of Figure 4, they are defined as follows:

For speaker A, SpSa = E26 + E27 + . . . + E34 + E35.

For speaker B, SpSb = E36 + . . . + E40 + E66 + . . . + E70.

For speaker C, SpSc = E71 + E72 + . . . + E79 + E80.

A pause (P) includes all entries in which a person has the floor and is not vocalizing. Pauses can also be defined in terms of two previously-defined parameters--floor time and vocalizations. The total duration of pause events can be obtained by subtracting the speaker's vocalizations from his floor time:

For speaker A, Pa = FTa - Va = [R1].

For speaker B, Pb = FTb - Vb = [R6].

For Speaker C, Pc = FTc - Vc = [R11].

time t+1

time t	A	B	C
A	aa	ab	ac
B	ba	bb	bc
C	ca	cb	cc

Figure 5: Who-follows-whom transition matrix

Hypotheses

Given this descriptive classification of verbal behavior, we are now in a position to state a number of hypotheses about the relationship between communicative predispositions and verbal behavior in triads. At the individual level, the hypotheses refer to differences in sound-silence behaviors for subjects with differing propensities to engage in or withdraw from verbal interaction. The group-level hypotheses refer to differences in sound-silence behaviors attributable to the verbal propensities of the other group members.

Individual-Level Hypotheses

There is a positive linear relationship between a person's propensity to verbalize and the

1a. amount of vocalizations

2a. number of speaker switches

3a. amount of floor time

4a. amount of simultaneous speech

5a. amount of pauses

6a. percentage of floor time spent vocalizing

7a. mean duration of utterances

8a. amount of talk-overs

Group-Level Hypotheses

There is an inverse relationship between the verbal propensities of an interactant's co-participants and the

1b. amount of vocalizations

2b. number of speaker switches

3b. amount of floor time

4b. amount of simultaneous speech

5b. amount of pauses

6b. percentage of floor time spent vocalizing

7b. mean duration of utterances

8b. amount of talk-overs

Hypotheses 1a and 1b refer to the total productivity of a given individual. Persons with a tendency to verbalize a great deal are expected to vocalize more than those predisposed to talk only a little. Conversely, persons interacting in high-verbal groups are expected to talk less than persons interacting in low-verbal groups.

Hypotheses 2a and 2b refer to the conditions affecting the frequency with which a person speaks, since the number of speaker switches can be thought of as the number of times a person obtained possession of the floor. Hypothesis 2a suggests that high-verbal individuals tend to acquire the floor, and therefore speak, more often than their low-verbal counterparts. Hypothesis 2b suggests that individuals interacting in high-verbal groups will have a harder time obtaining the floor than they would in low-verbal groups.

The hypotheses related to floor time (hypotheses 3a and 3b) refer to the total amount of time a given participant maintained possession of the floor. These hypotheses follow directly from the first two sets of hypotheses.

The hypotheses on simultaneous speech (hypotheses 4a and 4b) indicate the degree to which the listeners intruded on the speaker's floor time. Since simultaneous speech can only occur when the speaker has the floor and is vocalizing, it was expected that the simultaneous speech data would be similar to the data on vocalizations.

The hypotheses related to pauses (hypotheses 5a and 5b) may seem anomalous, since pauses are the inverse of vocalizations. Yet both pauses and vocalizations can only be accumulated when a person is also accumulating floor time. Since the hypothesis on floor time and vocalizations both predict that high-level individuals will be more active in the conversation, it was expected that the high-verbal subjects would also have more instances of pause time attributable to them.

Hypotheses 6a and 6b refer to a given individual's verbal output relative to that person's total floor time, and is measured by the ratio of vocalizations to floor time. In a sense, this provides a measure of how "efficiently" the available floor time is being utilized.

Hypotheses 7a and 7b refer to the mean duration of utterances. Note that hypotheses one and two predict that high-verbal individuals will both obtain the floor more often and talk more frequently than the low-verbal individuals. Thus the expected difference in verbal behavior could possibly be attributed solely to the <u>frequency</u> with which the different subject-types obtained the floor, and not to differences in the <u>average duration</u> of vocalizations within a given instance of floor time. It was expected, however, that the different subject-types would differ both in their frequency and their mean utterance duration, and hypotheses 7a and 7b reflect this expectation. Mean utterance duration was determined by dividing the vocalizations for a given speaker by the frequency with which that individual had the floor--that is, the number of speaker switches for that person.

The final set of hypotheses (hypotheses 8a and 8b), like those for simultaneous speech, refer to those instances when more than one individual is speaking concurrently. But whereas simultaneous speech refers to those instances when another group member speaks while the designated subject has the floor and is speaking, talk-overs refer to those instances when the designated subject is speaking while some other group member has the floor and is speaking. He or she is therefore "talking-over" the speaker who has the floor. Thus simultaneous speech refers to the "target" of the multiple speech act while talk-overs refer to the "initiation" of the multiple speech act. In terms of the row vectors in the 15-state transition matrix, talk-overs are defined as follows:

For speaker A, TOa = [R9] + [R10] + [R13] + [R15].

For speaker B, TOb = [R3] + [R5] + [R14] + [R15].

For speaker C, TOc = [R4] + [R5] + [R8] + [R10].

Design

Subjects

Students from the basic course in Interpersonal Communication were tested for propensity to verbalize using the Verbal Reticence (VR) Scale, (Lustig, 1974). The VR Scale is a 23-item paper-and-pencil instrument designed to measure an individual's propensity to engage in or withdraw from verbal interaction. Those scoring one standard deviation above the mean were designated as verbally reticent (HVR); those scoring one standard deviation below the mean were designated as highly verbal (LVR); those within ½ standard deviation of the mean were designated as moderately verbal (MVR). A total of 108 people, 18 males and 18 females in each of these ~~three~~ Three classifications, were thus selected to participate. Of this total, six males and six females in each classification (N=36) were randomly selected to serve as the "experi-

mental" subjects upon whom data were collected, while the remaining 24 individuals in each classification served as the "group members."

The 24 group members within each classification were then paired with an opposite-sex member, forming 12 mixed-sex dyads for each of the three classifications. For example, 24 LVR individuals were paired with one another, forming 12 LVR-LVR groups, 12 MVR-MVR groups, and 12 HVR-HVR groups. Finally, the experimental subjects were assigned, in equal numbers, to the various groups. The resulting triads involved one of three types of individuals (LVR, MVR, or HVR), who could be one of two sexes, and who were paired with one of three types of groups (LVR-LVR, MVR-MVR, or HVR-HVR).

Method

Upon arriving at the experimental location, Ss were seated in comfortable chairs in a small experimental room. Throat microphones were placed on each triad member, and care was taken to be certain that the microphones fit snugly but without binding. The throat microphones were connected to a four-channel tape recorder located in an adjoining room. The use of the throat microphones allowed each person's vocalizations to be collected on separate channels of the tape recorder with minimal spillover between the participants.[1] Eight minutes of conversation were obtained for each of the 36 groups. The groups were asked to discuss alternative grading procedures for the communication course in which they were all currently enrolled. The discussion problem was selected because no specialized information was required of the members. Subjects reported during the debriefing session that they were involved in the discussion and they perceived the task to be relevant and purposeful.

Vocalizations for each group member were recorded on a single channel of a four-track tape recorder. Thus the interaction of the three individuals who composed a given group was contained in the three channels of the

recorder, with each person's vocalizations recorded on a separate channel. Each conversation was then analyzed by playing the audio tapes, one channel per input, in real time, into the analog-to-digital converter of a PDP-12 computer. The three inputs were simultaneously sampled four times per second for each of the eight-minute conversations. The input signals were coded by the computer at each sampling interval, indicating whether an impulse (i.e., a vocalization) above a minimum threshold was or was not occurring in each of the sampled channels. This procedure transformed the conversation into the eight-state classification scheme of Figure 2.

Through a translation program, the eight-state classification data were then converted into the fifteen-state classification data described earlier. Following this reclassification, the data were recast into a transition matrix for the 15-state classification. A transition matrix was obtained for each of the 36 groups.

Finally, the dependent variables (e.g., vocalizations, floor time, etc.) for the designated subject were derived from the transition matrices. These data were punched on machine-readable cards and subjected to statistical analysis.

Statistical Analysis

Data were analyzed in a 3 x 2 x 3 split-plot factorial design. Factor A corresponded to subject type, with three levels (LVR, MVR, or HVR); factor B, with two levels, corresponded to subject sex; factor C, with three levels, corresponded to group type (LVR-LVR, MVR-MVR, or HVR-HVR); and subjects were nested within factors A, B, and C. Separate analyses-of-variance were computed for each of the dependent variables.

The hypotheses refer specifically to the data in factors A and C. Hypotheses 1a, 2a, and 3a all refer to the data in factor A; hypotheses 1b,

2b, and 3b all refer to the data in factor C. Rather than an overall F-statistic to assess main effects for factors A and C, each hypothesis was tested by using two separate planned orthogonal comparisons. Since the hypotheses predict linear trends, the sum of squares for factors A and C were partitioned into linear and quadratic trend components. The linear contrast for factor A compared the means of the LVR Ss with the means of the HVR Ss. The quadratic contrast for factor A compared the average of the LVR Ss and the HVR Ss with the MVR Ss. In assessing the linear contrast, our hypotheses suggested that the means of the LVR Ss would be significantly larger than the means of the respective HVR Ss. Because of the directionality of these predictions, one-tailed tests were performed. For the quadratic contrasts, no directionality was predicted, and two-tailed tests were performed. In order to confirm the hypotheses, it was expected that the linear contrast would be significant and the quadratic contrast would not be significant.

Each of the contrasts was tested at $\alpha = .05$, and each contrast had power of at least .80 to detect a difference equal to one standard deviation in means. Although there were no specific hypotheses concerning sex differences, or interaction effects between factors, data on these variables were also assessed. Factor B, the sex variable, and all between-group interaction effects, were tested by using the standard critical values.

Results

Individual-Level Hypotheses

A summary of the analyses of variance for data related to the individual-level hypotheses is provided in Table 1. The means for these data are provided in Table 2.

Hypothesis 1a was confirmed. The linear contrast was significant and the quadratic contrast was not significant. Examination of the means for

the data on vocalizations reveals that LVR Ss did indeed verbalize more than their HVR counterparts. Thus the difference in means between LVR and HVR Ss is both significant and in the predicted direction.

Hypothesis 2a was only partially confirmed. LVR Ss did, in fact, obtain the floor more frequently than the HVR Ss. As predicted, the linear contrast was significant. However, contrary to expectations, the quadratic contrast also approached significance at $\alpha = .08$. Inspection of the means reveals that the MVR Ss spoke slightly more frequently than the LVR Ss, who in turn spoke considerably more frequently than the HVR Ss.

Hypothesis 3a was confirmed. The linear contrast was significant and the quadratic contrast was not significant. The means indicate that LVR Ss maintained the floor significantly longer than HVR Ss.

Hypothesis 4a was confirmed. The analysis reveals that LVR Ss were, in fact, simultaneously spoken to more often than the HVR Ss.

Hypothesis 5a was partially confirmed. The analysis reveals a strong linear component which was significant at the .005 level. However, the quadratic contrast approached significance at $\alpha = .10$. The means table indicates that LVR Ss had more instances of silence attributable to them than either the MVR or the HVR Ss, although the difference between the MVR and the HVR Ss is negligible.

Contrary to expectations, hypothesis 6a was not confirmed. The linear contrast was not significant, while the quadratic contrast approached significance at $\alpha = .10$. Inspection of the means for percentage of floor time spent vocalizing suggests that there was a slight tendency for MVR Ss to be more "efficient" than either the LVR Ss or the HVR Ss.

Hypothesis 7a was not confirmed. Neither the linear nor the quadratic contrasts were significant. Likewise, hypothesis 8a was not confirmed.

Dependent Variables	Mean Square	$F_{1,18}$	t_{18}	Significance
Vocalizations				
Linear	93875.04	5.140	2.27	.025
Quadratic	1128.13	0.06		N.S.
Speaker Switches				
Linear	630.38	3.09	1.76	.05
Quadratic	767.01	3.76		.08
Floor Time				
Linear	552673.50	16.28	4.03	.001
Quadratic	46309.39	1.36		N.S.
Simultaneous Speech				
Linear	1617.04	5.04	2.24	.025
Quadratic	583.68	1.82		N.S.
Pauses				
Linear	190995.04	12.33	3.51	.005
Quadratic	61893.35	3.99		.10
Percent Floor Time in Vocalization				
Linear	0.002	0.14	0.01	N.S.
Quadratic	0.043	3.07		.10
Mean Utterance Duration				
Linear	10.43	1.76	1.33	N.S.
Quadratic	8.03	1.36		N.S.
Talk-Overs				
Linear	37.50	0.14	0.37	N.S.
Quadratic	296.06	1.14		N.S.

Table 1: Summary of Analyses of Variance of the Dependent Variables for Subject-Type (Individual-Level Hypotheses)

Neither contrast was significant.

Group Level Hypotheses

None of the contrasts for any of the group-level hypotheses approached significance. Therefore, none of the group-level hypotheses was confirmed. Table 3 provides the means of the dependent variables for group type. All differences appear to be negligible.

Dependent Variables	LVR	MVR	HVR	Significance Level for Contrasts
Vocalizations (in quarter seconds)	329.08	278.42	204.00	Lin = .025 Quad= N.S.
Speaker Switches	47.42	52.09	37.17	Lin = .05 Quad= .08
Floor Time (in quarter seconds)	844.42	616.59	540.92	Lin = .001 Quad= N.S.
Simultaneous Speech (in quarter seconds)	26.67	27.00	10.25	Lin = .025 Quad= N.S.
Pauses (in quarter seconds)	515.34	338.17	336.92	Lin = .005 Quad= .10
Percentage of Floor Time Spent Vocalizing	0.38	0.45	0.37	Lin = N.S. Quad= .10
Mean Utterance Duration	6.89	5.23	5.57	Lin = N.S. Quad= N.S.
Talk-Overs	16.41	23.75	18.91	Lin = N.S. Quad= N.S.

Note: The linear contrasts compared the mean of the LVR Ss to the mean of the HVR Ss and was tested one-tailed. The quadratic contrasts compared the mean of the MVR Ss with the average of the means for the LVR and HVR Ss and was tested two-tailed.

Table 2: Means and Significance Levels of the Dependent Variables for Subject-type (Individual-Level Hypotheses)

Sex Differences

With only two exceptions, sex differences tended to be minimal. Sex differences for the data on floor time approached significance at $\alpha = .06$ ($F_{1,18} = 3.85$). Females maintained the floor, on the average, 181.89 seconds, while males maintained an average floor time of only 151.77 seconds. Similarly, sex differences for the data on pauses approached significance at $\alpha = .10$ ($F_{1,18} = 3.40$). Females had an average total pause duration of 108.77 seconds,

while males pauses, on the average, only 89.64 seconds.

Interaction Effects

None of the two-way or three-way interactions approached signficance.

Dependent Variables	LVR-LVR	MVR-MVR	HVR-HVR
Vocalizations (in quarter seconds)	287.42	244.00	280.08
Speaker Switches	46.17	46.17	44.34
Floor Time (in quarter seconds)	634.75	654.17	713.00
Simultaneous Speech (in quarter seconds)	22.59	20.00	21.34
Pauses (in quarter seconds)	347.34	410.17	432.92
Percentage of Floor Time Spent Vocalizing	0.44	0.37	0.38
Mean Utterance Duration (in quarter seconds)	6.17	5.34	6.19
Talk-Overs	22.66	17.25	19.16

Note: The linear contrast compared the mean of the LVR-LVR groups to the mean of the HVR-HVR groups. The quadratic contrasts compared the mean of the MVR-MVR groups with the average of the means for the LVR-LVR and HVR-HVR groups. All group-level contrasts were non-significant.

Table 3: Means of the Dependent Variables for Group-Type (Group-Level Hypotheses)

Discussion

The results indicate that LVR Ss differed from HVR Ss in a number of significant respects. LVR Ss vocalized more, they vocalized more often, they maintained the floor longer, they were simultaneously spoken to (i.e., interrupted) more, and a greater number of silences were attributed to them. This conforms to the present conception of the verbally reticent individual as a person who is disinclined to engage in oral communication and whose verbal output in interactive situations is characteristically low (Lustig, 1974; Rosenfeld & Plax, 1976).

There were no significant differences betwen LVR and HVR Ss in the percentage of floor time spent vocalizing, the number of talk-overs, or the mean utterance duration. No significant differences were obtained which related to the subject's sex, although females tended to have more silences and consequently more floor time attributed to them. There were no differences related to group type, and no significant interaction effects were obtained.

Although LVR Ss talked more and more often than the HVR Ss, the average duration of vocalizations did not differ. That is, although differences in the mean utterance duration were not significant, LVR Ss tended to obtain the floor, and therefore speak, more often than the HVR Ss. It should be emphasized that this result could only be obtained in an investigation of groups larger than two, since the number of speaker switches for a dyadic conversation is equal.

Despite the fact that LVR Ss were simultaneously spoken to for a longer period of time, they were not responsible for talking-over others more frequently than the HVR Ss. This suggests two possibilities, both of which were a factor to some degree:

(1). Given that the LVR Ss talked more frequently, the tactic adopted by the other group members, in order to obtain the floor, was to interrupt them. This may have functioned to restrict their average duration of vocalizations. That is, although the LVR Ss may have wanted to talk for longer periods of time, they may not have been able to, simply because the other Ss interrupted them. Consequently, the LVR Ss simply talked more often.

(2). Since the data for both simultaneous speech and talk-overs refer to the total number of quarter-second intervals in which multiple talking occurred, it is likely that LVR Ss were reluctant to yield the floor when interrupted. Consequently, each interruption attempt lasted for a slightly longer period of time, and the total number of data-points involving multiple speech acts were higher. That is, unlike the HVR Ss, the LVR Ss did not immediately yield the floor when interrupted: there was a brief but noticeable control struggle.

Table 4 provides the means and standard deviations of the eight dependent variables. It is instructive to compare some of the means in the present investigation with those of Brady (1968) and Jaffe and Feldstein (1970). It should be understood, however, that the methods are not quite comparable. Brady used a sampling rate of 5 millisecond intervals, while Jaffe and Feldstein sampled their data at 300 millisecond intervals. Data in the present investigation was sampled at 250 millisecond intervals. More importantly, the data for both previous investigations were collected on dyads, whereas the present data were obtained by analyzing the conversations of triads. Brady obtained his data by analyzing telephone conversations, while Jaffe and Feldstein's data are a composite of various dialogues ranging from structured interviews to social conversations.

Although several of the category definitions used in the investigations of dyads needed to be modified for the present study, data on three paralinguistic measures were directly comparable: the mean utterance duration, the percent of vocalizations per speaker, and the percent of simultaneous speech per speaker. The latter two metrics were computed, for purposes of this comparison, by dividing the mean for vocalizations and the mean for simultaneous speech, respectively, by the mean for floor time.

As Table 5 indicates, the data are surprisingly similar. Despite methodological differences, all three studies yield comparable parameters.

Table 6 provides the correlation matrix for the dependent variables. As with the data on means, it is instructive to compare the correlations in the present investigation with the data obtained by Jaffe and Feldstein (1970).

The measure of pauses used in this investigation does not differentiate between within-speaker pauses and switching pauses (i.e., a pause followed by a speaker switch). Although the data are therefore not directly comparable with that of Jaffe and Feldstein, the studies can nevertheless be contrasted. It should be noted that the correlation between within-speaker pauses and switching pauses in Jaffe and Feldstein's studies was about .60.

Jaffe and Feldstein report correlations between within-speaker pauses and simultaneous speech which ranged from -.07 to -.22; the correlations between switching pauses and simultaneous speech ranged from .05 to -.26. In the present investigation, two measures which involve multiple speech acts were computed: simultaneous speech and talk-overs. The obtained correlation between pauses and simultaneous speech was -.101, while the correlation between pauses and talk-overs was -.283. These correlations are very similar to those obtained by Jaffe and Feldstein.

	Mean	Standard Deviation
Vocalizations (in seconds)	67.625	35.017
Efficiency	.397	.120
Speaker Switch	45.556	16.212
Floor Time (in seconds)	166.826	55.576
Simult. Speech (in seconds)	5.326	4.976
Pauses (in seconds)	99.201	35.487
Talk-overs (in seconds)	4.923	4.224
Mean Utterance Duration (in seconds)	1.475	.558

Table 4: Means and Standard Deviations of Dependent Variables

Measure	Brady[a]	Jaffe and Feldstein[a]	Lustig
Mean Utterance Duration (in seconds)	1.17	1.64	1.48
Percent Vocalization (per speaker)	39.50	35.40	40.53
Percent Simultaneous Speech (per speaker)	4.49	3.29	3.20

[a]Data reported in Jaffe and Feldstein (1970)

Table 5: Some mean values from triads and comparable values from dyads obtained by Brady (1968) and Jaffe and Feldstein (1970)

	Vocal.	Effic.	Speaker Switch	Floor Time	Simult. Speech	Pauses	Talk-Overs	Ave. Durat. Vocal.
Vocalizations	1.000							
Efficiency	.751	1.000						
Speaker Switch	.736	.653	1.000					
Floor Time	.785	.222	.493	1.000				
Simult. Speech	.821	.807	.816	.453	1.000			
Pauses	.243	-.393	.046	.791	-.101	1.000		
Talk-Overs	.536	.642	.695	-.430	.720	-.283	1.000	
Mean Utterance Duration	.678	.425	.047	.651	.304	.350	.061	1.000

Table 6: Correlation Matrix of Dependent Variables

Many of the other obtained correlations are considerably higher than the relationships reported by Jaffe and Feldstein. For example, Jaffe and Feldstein's correlation between vocalizations and speaker switches was -.10, while the correlation between speaker switches and simultaneous speech was .19. The same relationships computed for triads produced a correlation between vocalizations and speaker switches of .736, while the correlation between speaker switches and simultaneous speech was .816. The correlation between talk-overs and speaker switches was .695.

Much of the difference in the studies is related to the difference between measures computed for dyads versus triads. For dyads, we would expect the correlations related to speaker switches, for example, to be close to zero, since the number of speaker switches is equal for both participants. Thus, if one person in a dyadic situation talked a great deal, while the other vocalized only briefly, the computed correlation between vocalizations and speaker switches should be close to zero; both speakers would have obtained the floor an equal number of times. This is not so in triads, where vocalizations are directly related to speaker switches. While the number of speaker switches in dyads is necessarily equal for both participants, the speaker switches for triadic conversations reflect the possibility of uneven participation among group members.

Since the expected differences related to group-type were not substantiated, the evidence upon which the group-level hypotheses were originally founded deserves a reconsideration. Borgatta and Bales (1953) initially observed that a given subject talked more when placed with low-verbal interactants, and he talked less when placed with high-verbal interactants. They therefore concluded that a person's rate of interaction was both a consistent manifestation of his general interaction style and a function of the others

present. The group-level hypotheses were based on this finding that a person's rate of interaction is inversely related to the interaction rates of his co-participants.

The present data provide contradictory evidence by suggesting that a person's rate of interaction is not linearly related to the interaction rates of his co-participants.

One possible explanation for the present results is that, even in the highly verbal groups, there was still ample opportunity for each individual to talk as much as he or she wanted to. The data related to silences, for example, suggest that subjects would have had the opportunity to talk considerably more had they felt compelled to do so. Borgatta and Bales postulated an upper bound to the amount of participation in which an individual will engage, regardless of the opportunities available to participate. The other group members function as a limiting factor by providing competition for the available floor time. It is possible, therefore, that the subjects were not operating at or near their verbal upper bound, so that the effects of group composition on verbal behavior were negligible. Although significant differences between subject-types were obtained at the individual level, it is possible that the demand characteristics of the situation precluded finding an even larger effect.

The relationship between situational contraints and communicative behaviors therefore demands further inquiry. Mortensen and Arntson (1974) describe preferred communicative strategies as a cognitive orientation which is activated when expectations and social reality permit. These expectations and orientations toward certain behaviors are encouraged by normative and often implicit rules of interaction which function to proscribe "unacceptable" behavior patterns. Data recently collected by Zucker (1977) substantiates

the view that high-, moderate-, and low-verbal individuals have widely differing expectations about what is permissible and desirable in various social situations.

Conclusions

The present study suggests that paralinguistic data obtained from three-person groups is different from that of two-person groups in the relative distribution of speech acts between the participants. Information related to the patterning or pacing of verbal behavior, particularly the obtained distinction between the frequency and duration of verbal acts, ought to be explored in more detail.

This difference underscores Caplow's (1968) contention that dyadic interaction constitutes a special case of small group interaction, just as monologue has been conceptualized as a special case of dyadic interaction. Thus a triad is the minimal group size in which it is possible for a given member to define his participation as non-essential to the maintenance of the conversation.

Previous researchers of paralinguistic behaviors (Jaffe and Feldstein, 1970; Scheidel, 1974) have limited themselves to the interaction of dyads. While it may be true, as Jaffe and Feldstein (1970) have suggested, that an extension of the techniques for analyzing sound-silence patterns to groups larger than two ought to be straightforward, the present data suggest that the results of such an extension cannot, a priori, be assumed.

The present study has implicitly argued that theoretical terms such as "verbal reticence" and "verbal predispositions" have relevance only to the degree that they also have empirical accessability. This assertion runs counter to certain earlier views, most notably Steward's (1968) contention that the term "reticence" is wholly an attitudinal concept which cannot be

defined by any set of specifiable behaviors. Yet if one believes that a theory of communication must involve an understanding of human behavior, and that the empirical utility of any communication theory will therefore be contingent upon the theory's ability to adequately predict selected aspects of human behavior, then the terms of the theory must ultimately be definable by reference to observable or measurable attributes, behaviors, or relationships between human beings. In short, if there is no possible set of observations or measurements which can be used to define the concept "reticence," then there are also no specifiable criteria which can be used to determine those who are and those who are not members of the class of individuals defined by the concept.

It would be desirable if the present work could conclude with a complete behavioral description of reticent, moderate, and verbose individuals. But it cannot. In acquiring data about paralinguistic variables, the present study has eliminated from the research perspective every possible reason that the subjects could have to communicate with one another--that is, the meanings which the behaviors were supposed to stand for, or the patterns which each person was trying to communicate as he or she participated in the interaction. In that every encoded message is, to some degree, a statement both about the encoder of the message and the encoder's perception of the relationship between himself and those for whom the message is intended (Watzlawick, Beavin, and Jackson, 1967), we have also eliminated from consideration many of those cues which people provide to define who they are <u>vis a vis</u> the others in the interaction.

By converting the multifaceted stream of conversation into electrical impulses which represent sounds or their absence, we have therefore eliminated: all content information, including the meanings ascribed to the patterns of

sounds and silences; all nonverbal cues, including movements, gestures, gaze direction, facial configurations, body orientations, spatial proximity, touching behavior, physical appearance, and the contextual cues related to the setting or environment; and certain paralinguistic cues such as pitch, amplitude, and intonation.

Our data merely provide information about the frequency, duration, and sequencing of the sound-silence behaviors in triads. The complexity of the communicative behaviors required that we eliminate most of what was happening in order to obtain precision in the observation and analysis of what remained.

There seems to be, however, a strong theoretical justification for pursuing this approach.

In analyzing the deficiencies in the logic of sociological theories, Lachenmeyer (1971) points to a glaring inadequacy in the language of and therefore in the research perspectives through which sociologists view the world.

> Sociology avoids consideration of verbal behavior as a social reality. Yet, verbal behavior is the social reality. Without communication there would be no social life; verbal behavior, therefore, becomes critical in any theory about social behavior . . . . Moreover, without these [linguistic symbol systems], what are designated "social organizations," "social institutions," and "social structures" would not develop, function, or persist. Therefore, the study of verbal behavior is crucial for sociology, but no systematic, observation-based terminology has been developed in the area (p. 69).

Hayes and Meltzer (1972) echo this sentiment to their social-psychological colleagues:

> It is clear that the medium (vocalization) is itself a message. It would now seem appropriate for social psychologists to study the quantitative aspects of their main subject matter: social interaction, and in particular, talking. Our discipline has for too long considered speech, talking, communication as carriers of interesting variables rather than as phenomena of intrinsic interest. Talking is such a prominent behavior in social interaction that it is hardly surprising that human beings

> respond not only to the content of what is said but also to its manner (voice quality) and amount. These reactions to the quantity of talk include interpersonal feelings of affect and evaluation and group phenomena such as status hierarchies, leadership, and sociometric structures (p. 557).

Hayes and Meltzer's (1972) study on verbal behavior strongly suggests that an assessment of an individual's total amount of verbal participation can often constitute a sufficient cue for making a variety of interpersonal judgments about him. The assessment of communicative output then becomes a focal point around which other attributions center.

Early studies by Asch (1946) and Kelley (1950) on impression formation demonstrated that we do, indeed, form impressions of another even on making a brief observation of him or of hearing someone else describe a few of his salient characteristics. Asch believed that certain attributes are central in that they become a major focus of impressions and evaluations which are created about the other. These central attributes thus bear a large responsibility for organizing our perceptions of others. Later factor-analytic work on "dimensions" of interpersonal perceptions (Couch, 1960; Osgood et al., 1957; Carter, 1954; Leary, 1957; Foa, 1961; Bales, 1970) indicate that paralinguistic behaviors such as the rate, frequency, and synchrony of verbal behavior index directly, and in some cases virtually define, one of the primary dimensions of interpersonal evaluations.

If it is true, as has been argued, that an understanding of verbal behavior is central to the development of a theory of communication, then it is necessary to understand the paralinguistic (and also, most likely, prelinguistic) patterns related to the rate, frequency, duration, intensity, and synchrony of the verbal behavior. It is also necessary to ask why this crucial aspect of social life has been neglected by social scientists for so long. The answer, unfortunately, seems to be that the need for an understanding

of the patterning of verbal behavior has been ignored precisely because the behaviors are so obvious. This tendency to be "blind to the obvious" has led Ichheiser (1970) to declare that

> nothing evades our attention so persistently as that which is taken for granted. As a rule, we notice explicitly only those features of our total experience which strike our attention by their <u>not</u> being obvious. . . . The fact, therefore, that something is obvious need not mean that it is explicitly noticed, registered, and scientifically taken into account. Instead, something of the opposite is true. Obvious facts tend to remain invisible. . . .
>
> Herein lies the paradox. The higher the degree of penetration in our analysis of the world of complex and elusive human relations, the more striking is the impression that we are saying only something which "everybody knew all along." The point to remember, however, is that the illusory impression arises only <u>after</u> the analysis has been completed and is simply the consequence of taking implicit awareness (immediate experience) to be explicit knowledge (pp. 8-11).

The present study presents a strong argument for the controlled investigations of the pacing or patterning of verbal behavior in the small group setting. The findings also lend support to Chapple's (1939) notion that the timing of interpersonal interactions could provide the data needed for a reliable assessment of interindividual differences in social interaction. When considered in conjunction with previous research, the primary implication of the present investigation is that an understanding of individual differences in the patterning of verbal behavior is crucial to the development of a more general theory of communicative interaction.

Footnotes

[1]Ramsay and Law (1966) describe the advantages of throat microphones over conventional microphones:

> We have found a throat microphone to be most satisfactory; it is inexpensive, rugged and requires no special soundproof room. Background noise is eliminated and the distance from the subject's vocal cords is constant. A further point in favour of a throat microphone is that the subject can soon adapt to it and forget about it, whereas most subjects find difficulty in talking naturally if a microphone is constantly in view in front of them. With a throat microphone the volume into the recording apparatus can be set below the level at which breathing and throat noises are recorded, yet the voice easily triggers the relay circuit used to measure duration of speech (p. 98).

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